Face Recognition Using KNN Classifier

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Abstract

This paper presents face recognition using K-nearest neighbor classifier. We have worked on face feature values for the calculations in the system. This framework has been proposed to perceive human faces from a picture in the database and a few pictures which are not part of the database. We have utilized AT & T database which incorporates 400 pictures of 40 individuals. The fundamental goal of this review is to comprehend the materialness and capacity of KNN procedure in face recognition errand. Some critical outcomes and perceptions have gotten from this review.

Keywords- Database, AT & T, KNN, Face Recognition.

Introduction

The security of information and physical property is getting the opportunity to be crucial and troublesome. We get some answers concerning the infringement of Visa tricks, PC software engineers or security breaks in association et. So to comprehend this issue we have some biometric frameworks. Face recognition is one of just a modest bunch few biometric frameworks which are used for security purposes. Biometrics is best portrayed as quantifiable physiological or behavioral qualities that can be utilized to affirm the identity of a person.

Face recognition is an undertaking in which framework thusly recognizes human appearances in the database. The database is secured in the framework which fuses confront pictures. At whatever point we get another picture, it is differentiated and the database of face pictures starting at now set away in the framework. Neural framework make use of new face picture and the set away face pictures to make sense of whether there is a match .It is in every way a more ordinary and fruitful procedure to perceive a man since it is the same as the human does and there is no convincing motivation to use phenomenal sorts of apparatus.

In any case, there are a few issues in proposals sort of frameworks since it is extremely troublesome errand to perceive a man from a picture. There are a great deal of varieties in the pictures like: lighting conditions, forces, hues, remove from camera and so on. So it is extremely challengeable task. For catching the multifaceted nature of examples we need to utilize some neural system procedures.

A lot of techniques have been proposed for solving this task. In this study we worked on face recognition task by using K nearest neighbor technique. The basic objective of this proposed work is to understand the ability and capability of this artificial neural network technique for face recognition task. This proposed system consists of three basic steps:

- Feature detection
- Feature extraction.
- Face recognition.

In this proposed work:

- With the assistance of HOG feature extraction strategy we have prepared a data set of face feature values.
- To implement face recognition task , KNN artificial neural network technique has been implemented.

Literature Review

A research on face recognition using bagging KNN is carried out by (Ebrahimpour *et al*., 2012). In their proposed work they had used KNN as the main classifier and Bagging as the wrapping classifier technique. They had worked on ORL database. Their system's accuracy was 97.5%.

Parveen (Parveen *et al.,* 2006) carried out a research on face recognition using multiple classifiers. They had implemented LDA,KNN and SVM techniques for solving face recognition task. For speedup KNN they had implemented PCA in feature reduction. They had concluded that SVM and KNN are effective techniques for face recognition.

A research on A color face recognition using PCA and KNN classifier is carried out in (Maheswari *et al.,* 2015) they had used 700 images as training data and 350 images as testing data andobserved that from training data system correctly recognized 654 images and from testing data system correctly recognized 317 images . Their system was 92.47% accurate.

Manjveet (Kaur *et al*., 2012) carried out a research on k nearest neighbor classification approach for face and fingerprint at feature level fusion. They had used Gabor filter and PCA for feature extraction and an KNN for face recognition task, finger print recognition. Total number of images in training dataset was 40. They observed that KNN classifier with city block distance gave highest fusion value as compare to Euclidean, cosine and correlation.

Naufal (Mansor *et al*., 2011) carried out research on PCA based feature extraction and KNN algorithm for early jaundice detection. PCA method was implemented to study behavior of infant by feature extraction. KNN was implemented for detecting the face of infants. They concluded that their system was accurate for solving this task.

Proposed Work

In this proposed work

HOG features in matlab was implemented for feature extraction.

- AT & T database used for training and testing of the system.
- KNN classifier used for face recognition task.

Database: The system was implemented on AT & T database. It has 400 images of 40 people. We have used its 100 images as training data of the system. figure-1 and figure-2, shows few faces from database which have been used as testing dataset and training dataset in this proposed work.

Figure1 : Few faces from testing dataset

Figure 2: Few faces from training dataset

KNN: The K nearest neighbor (KNN) classifier is an extension of the simple nearest neighbor (NN) classifier system. The nearest neighbor classifier works in view of a basic nonparametric choice. Every query picture is analyzed in view of the separation of its components from the elements of different pictures in the training database. The closest neighbor is the picture which has the base separation from the query picture in the component space. The separation between two components can be measured in light of one of the separation capacities, for example:

City block distance:

$$d1(x, y) = \sum_{i=1}^{n} | xi - yi | \qquad 1$$

Euclidean Distance:

$$d2(x, y) = \sqrt{\sum_{i=1}^{n} | xi - yi |} \quad (2)$$

Cosine Distance:

$$dcos(x, y) = 1 - \frac{x./ y}{|x| / |y|} \quad (3)$$

K nearest neighbor algorithm uses K closest samples to the query picture. In this proposed work d2(Euclidean distance) technique was implemented to perform the task.

Algorithm:

- Each face feature value within the data set has a class label in the set.
- The data points', k-closest neighbors (k being the number of neighbors) are then found by analyzing the distance matrix by using Eq-(2).
- The k-closest data points are then analyzed to determine which class label is the most common among the set.
- The most common class label is then assigned to the data point being analyzed.

A. Architecture:

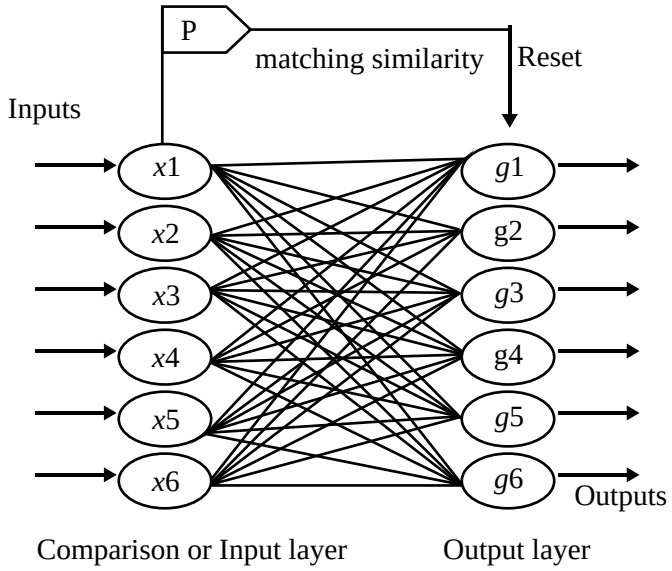

Figure 3: Network topology of KNN

In figure-3, there are two layers input layer and output layer. In input layer we have six number of face highlight values for the system from x1 to x6. KNN contrasted these face values and existing face values in the dataset (by computing Euclidean distance) and prepared group of similar faces from g1 to g6 and give labels . On the premise of this gathering, framework will perceive the appearances with ascertaining separation values. When we enter testing set of faces for recognition then framework will figure separate estimation of the testing appearances and contrast these separation values and existing countenances in the database and discover which confront has a place with which gather. At that point framework perceive the countenances.

Results and Observation

On the basis of this proposed work we have derived some results and observations of the system.

- KNN is accurate for face recognition task.
- It is more accurate in case of large databases as compare to small databases.

We can understand it by using the following results of the system.

In Table-1, When we have 90 number of faces in the database and 10 number of faces in testing dataset that time our system correctly recognize 9 faces out of 10. When we have 80 number of faces in testing data that time system correctly recognize 63 faces out of 80 and in the case of 90 faces in testing dataset that time system correctly recognize 69 faces , there are 21 wrong alarms.

In Table -2, when we have training ratio 10-90 our system is 76.7% accurate. When we increase it to 60-40 our system is 87.5% accurate and in case of 80-20 our system is 95% accurate.

It means when we increase our training data then our system is more accurate as compare to less database.

Table 1: Recognize faces using KNN

Training Data	Testing Data	Recognize correct faces	Wrong alarm
90	10	09	01
80	20	19	01
70	30	27	03
60	40	35	05
40	60	49	11
30	70	58	12
20	80	63	17
10	90	69	21

Table 2: Accuracy of proposed system

Training Ratio	Accuracy(%age)
10-90	76.7
30-70	82.9
60-40	87.5
80-20	95.0

Conclusion

On the premise of this review, we have been approving an exactness of K nearest classifier method in face recognition errand. This method is exact for this errand yet We watched that when there is extensive number of countenances in the training dataset that time framework was more precise as contrast with little training dataset. It implies augment in the quantity of appearances in training dataset likewise augment the precision of the framework The system work superbly well on still pictures.

References

Dhriti M.K., Kaur M. 2012. Nearest neighbor classification approach for face and fingerprint at feature level fusion . *International Journal of Computer Applications*. 60(12), 13-17.

Ebrahimpour H., Kouzani A. 2007. Face recognition using bagging KNN. *International Conference on Signal Processing and Communication Systems.*(ICSPCS).

Maheswari K.S., Babu C.H. 2015. A color face recognition using PCA and KNN classifier. *International Journal and Magazine of Engineering, Technology, Management and Research.* 2(9), 1110-1116.

Mansor M.N., Yaacob S., Muthusamy H., Basah S.N. 2011. PCA based feature extraction and KNN algorithm for early jaundice detection. *International Journal of Soft Computing and Software Engineering*. 1(1), 1-12.

Parveen P., Thuraisingha B. 2006. Face recognition using multiple classifiers. *IEEE international conference on tools with artificial intelligence.*

